humimeter.com®
SCHALLER GMBH

User manual

Moisture meter for determining
water content of biomass

humimeter BMA

version 1.8

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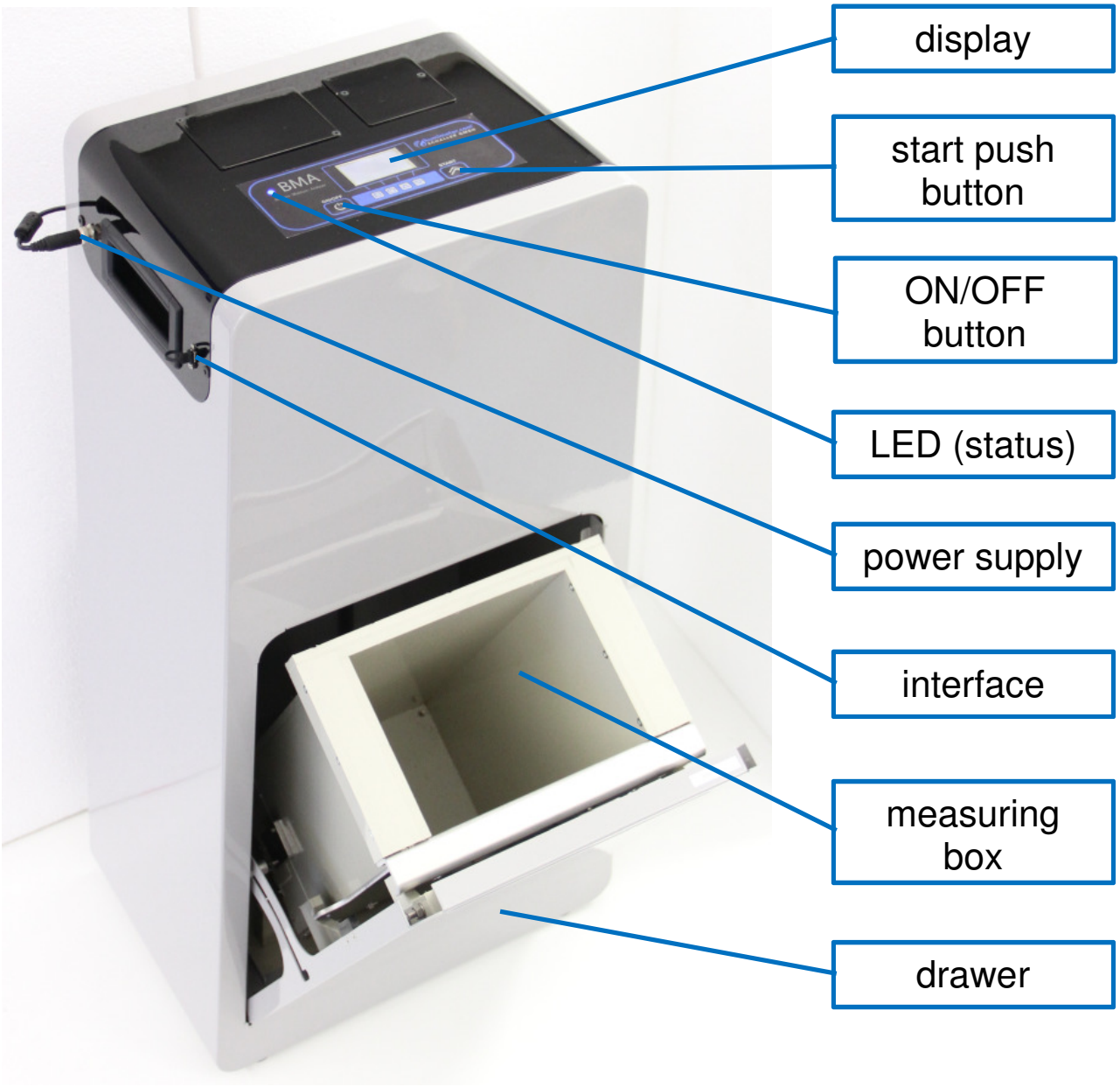
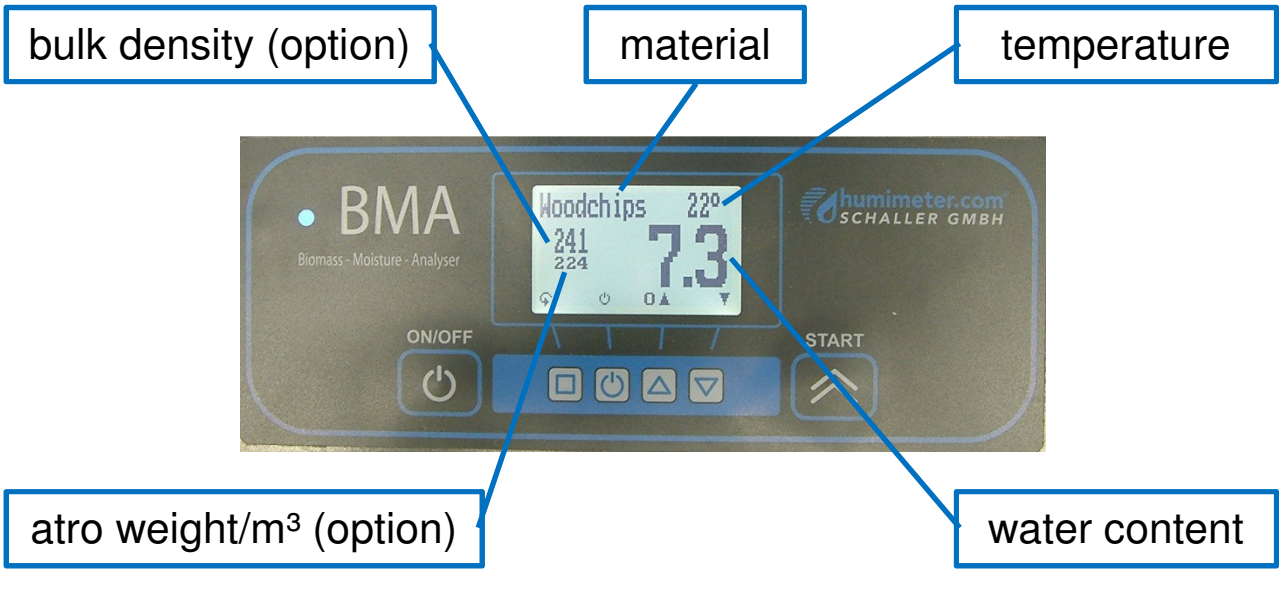
2014

Design of the device





Operation

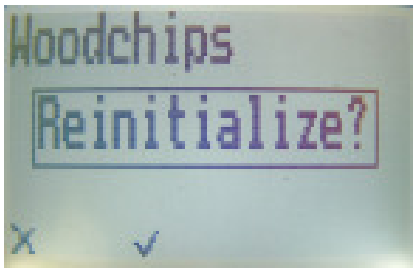
1. Put the empty measuring box into the humimeter BMA correctly. Make sure to hook in the aluminium part of the measuring box centrically into the plastic brackets of the drawer.

2. Close the drawer and push it down (normally this is effected automatically).

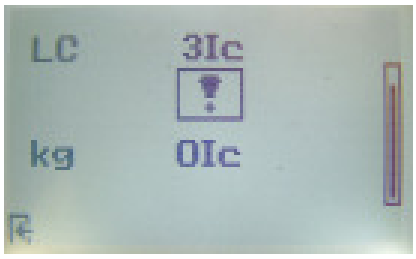
3. Plug in the round plug of the delivered power supply unit at the humimeter BMA and tighten it.

4. Plug in the power supply unit into a Schuko socket (230VAC).

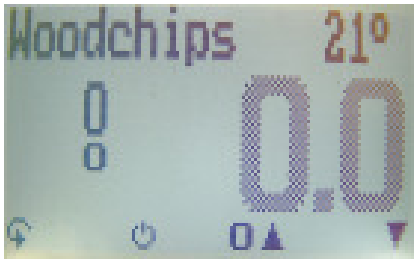
5. After plugging in, the humimeter BMA switches on automatically. If not, switch on the instrument by pressing the ⏻ button for 3 seconds.



6. The query for a self calibration „Reinitialize?" shows up on your display. Accept by pressing the ✓ button.



7. The self calibration has finished when the display shows the measuring window.



8. If the self calibration cannot be completed successfully, please read through page 12, header fault correction.

Measuring procedure

1. Open the drawer of the humimeter BMA and take out the measuring box. For that, lift the box and then pull it out.

2. Completely fill up the measuring box with the material to measure. For that you must use the delivered bucket.

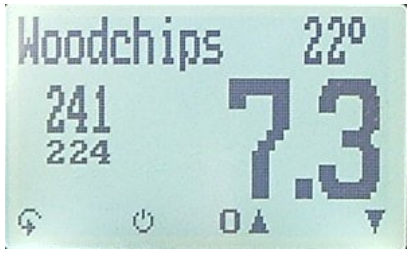
3. Wipe off the material at the upper edge of the box evenly.

4. Put the filled measuring box into the drawer correctly and close it.

5. Select the right product (calibration curve) using the arrow keys.

6. Press the Start push button. The measurement will start automatically. During the measurement, the LED is blinking in blue and the display shows the symbols for an ongoing measurement (see picture).

7. After the measuring procedure is completed, the LED is shining in blue constantly and the measuring values are shown on the display.



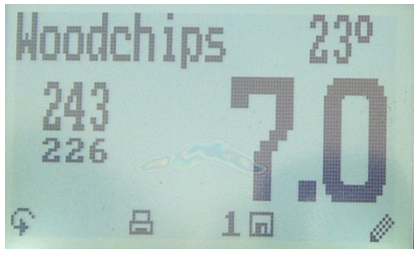
8. If desired the measuring values can be saved now. For that, please follow the instructions on the next page.

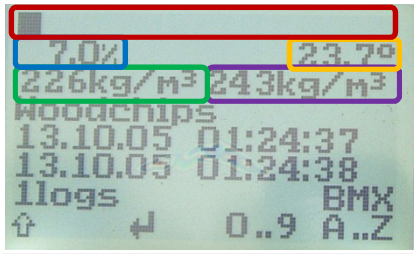
9. Open the drawer and carefully remove the measuring box.

10. Empty the measuring box completely.

Saving of measuring values

1. If desired the measuring values can be saved in the store menu by pressing the 🖫 button (△ button). The storage was successful when the number in front of the symbol 🖫 increases. To reach the store menu please press the left button (↶) as long as the symbol 🖫 appears.
2. To name the saved results press the ✎ button.
3. Here you can name the measuring series using numbers and letters. For numbers press △ (0..9) and for letters ▽ (A..Z).
4. After entering the name, confirm by pressing ⏻ (Enter). Now the saving is completed.





name of series

water content (average)

temperature (average)

atro weight / m³ [kg/m³] (average) ***optionally***

bulk density [kg/m³] (average) ***optionally***

Note: The accuracy of a measurement can be improved by performing several measurements (3) with the same sample and calculating the average of them. If the individual measuring values are stored on the BMA, the device calculates the average automatically.

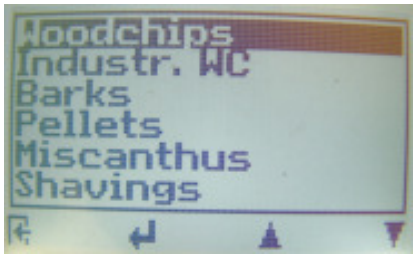
Printing hot key *(only with optional integrated printer)*

Pressing the second button from left (⏻) the last saved measuring series is printed.

Note: This means that the last saved value is printed, and not the last measured value.

List of calibration curves

Pressing one of the arrow keys in the measuring window for at least 3 seconds, a list of all available calibration curves will appear. Select your desired product using the arrow keys and confirm by pressing ↵.



Calibration curves

name (material)	description	dimensions	measuring range
Woodchips	forest wood chips (or similar)	P16 - P45	5 - 70 %
Coarse ch.	wood chips with less fines	P45	5 - 70 %
Industr. WC	wood chips without fines	P45 - P63	5 - 70 %
Barks	barks	P31,5 - P45	5 - 70 %
Pellets	wooden pellets	Ø 6 mm	5 - 14 %
Miscanthus	chopped miscanthus	similar P16	5 - 35 %
Shavings	shavings		5 - 45 %
Sawdust	sawdust		5 - 70 %
Corn cob	corn cobs (chopped or total)		5 - 40 %
Empty 1	for special sorts (calibration by Schaller GmbH)		
Reference	for testing humimeter BMA. Not suited for measuring!		

Selection of the right calibration curve:

These are advices for selecting the right calibration curve. If you are not sure about the right calibration curve, we recommend carrying out a comparison measurement by kiln drying (EN 14774). *At page 12 and 13 you find pictures of different sorts of wood chips.*

Determination of the material reference moisture

The humimeter BMA determines the water content, this is the moisture related to the total mass (wet base):

$$\%WG = \frac{Mn - Mt}{Mn} \times 100$$

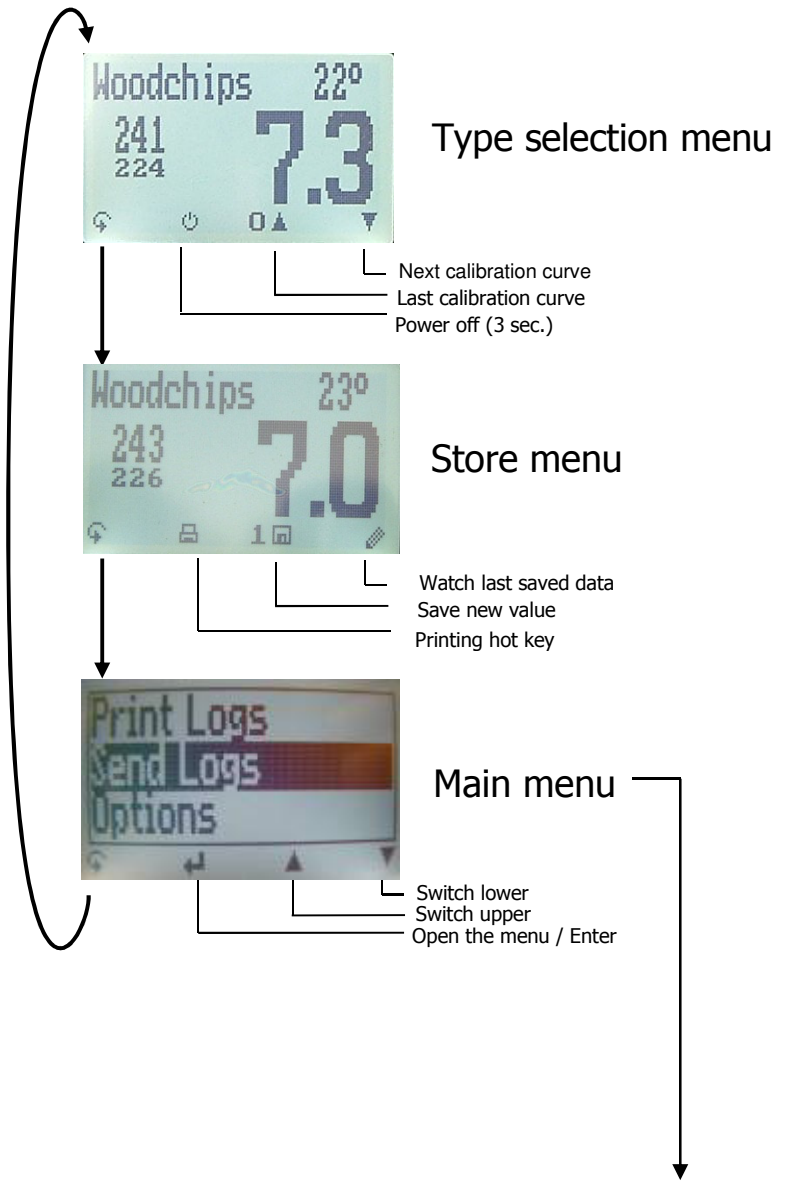
M_n: Mass with average moisture content
M_t : Mass of the dried sample
%WG: water content (according to norm EN 14774)

Definition of wood chips classes (EN 14961)

The stated numbers refer to the particle size that goes through round gaps of the corresponding diameters (e.g. P16: 16 mm).

- **P16** minimum 75% of mass is between 3.15 and 16 mm
- **P31,5** minimum 75% of mass is between 8 and 31,5 mm
- **P45** minimum 75% of mass is between 8 and 45 mm
- **P63** minimum 75% of mass is between 8 and 63 mm

Menu level overview



Keypad symbols

Measuring window:

	Rolling menu
	On/Off
	Switch upper
	Switch lower
	Save
	Watch saved data
	Add suppliers data

Menu:

	Enter
	Switch upper
	Switch lower
	Back
0..9	Enter numbers
A..Z	Enter letters
	Next or right
	Left
	Yes
	No
	Shift
OK	OK

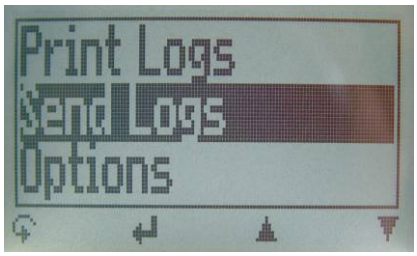
Overview main menu

Edit logs	*Options*
Manual logs	Date / Time
Clear logs	Datalog Time
	Language
Print logs	Unlock
Last log	°C / °F
All logs	o Userlevel
Clear logs	BL On time
	Auto Off Time
Send logs	Calibrate
Manual logs	Materialcalib.
Clear logs	Adjust
	Password
Options	Reset
	SN.
Status	Logo
	Admin

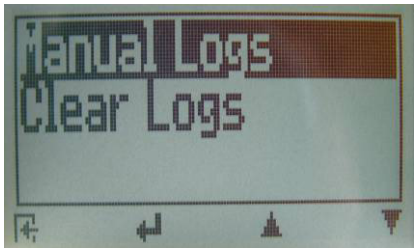
Transfer saved data to the PC

(only possible with USB data interface module)

To send your saved logs to the PC, connect the humimeter device to your PC using the USB cable that was delivered with your device. Carefully loosen the protection cap on your humimeter and plug in the USB miniB connector. The bigger connector has to be connected to a USB slot on your PC.
Start the LogMemorizer software on your PC and switch on your humimeter BMA.
The data transfer can be started on your humimeter or on the software:

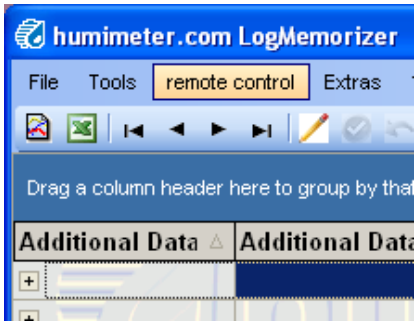


<u>Starting the data transfer on the humimeter:</u>

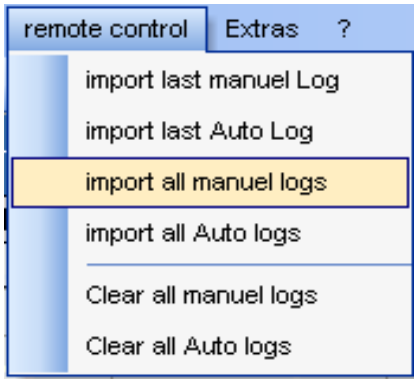


Press the ↶ key until you reach the menu (see image on the right). Then choose „Send Logs“ and confirm by pressing the ↵ key. Now choose „Manual Logs“ and confirm with ↵ again. All saved logs will be sent to your PC now.

<u>Starting the data transfer on your PC:</u>



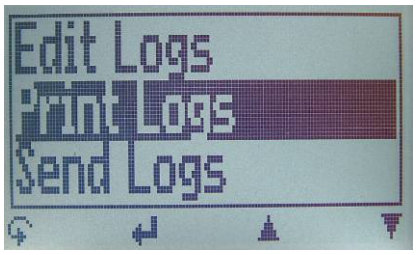
Press the button „remote control“ in the LogMemorizer software. A drop-down menu with several options opens (see image below).
For transferring the data you can select „Import last manual log“ (the last saved measuring series is transferred) or „Import all manual logs“ (all saved logs are transferred).
If you click on one of these menu items, the transfer starts immediately.
For the basic adjustments of the software please look through the instructions on the LogMemorizer USB flash drive.



Print saved data

(only possible with optional integrated printer)

To print out your saved data, send a print job at your humimeter device.



For that press the ↻ button until you reach the menu (see image on the right). Select the menu item „Print logs“ and confirm by pressing ↵.

Now you can select if you want to print the last saved measuring series or all saved measuring series (logs).

Confirm by pressing ↵ again. The selected logs are printed out now.

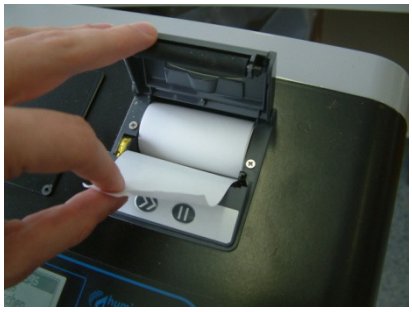
To save paper, please think of clearing the data storage regularly.

If the printing has been started successfully, the printer begins to print out the logs immediately. The green LED shows the correct operation.

Changing the paper roll

For exchanging a blank thermo paper roll, lift up the clip until the cover opens (see picture).

Remove the blank roll.



Put a new opened roll into the printer, ensuring that the paper comes out to the fore (see picture).

While closing the cover, hold the beginning of the paper tightly to prevent the paper from wrinkling.

Now the printer is ready for use again.

Several functions

Setting the clock

2 times ↶ -> Options -> Date / Time
Enter date and time using the ▲ button. Pressing the ▼ button the cursor shifts to the next place. Pressing the ↵ button (OK) your entry will be saved.
Info: If the power supply unit is unplugged the clock stands still!

Unlocking the instrument (Super User)

2 times ↶ - *Options* – Unlock
Enter the 4-digit password using the button ▲ (standard is the 4-digit serial number) and confirm by pressing ↵.

Online print

2 times ↶ -> Options -> o Online Print
For choosing that menu item you have to unlock your BMA first!
If you have activated that function, your BMA will print the current measuring value after pressing save button immideatley.

LED signals

Shining in blue	device is ready for operation
Blinking in blue	ongoing measurement
Blinking in red	failure

Possible reasons for failure (red blinking LED):

- Drawer has not been closed correctly
- Measuring box is missing resp. empty
- Wrong positioning of measuring box
- Overloaded motor for compression

⇨ *The failure can be confirmed by pressing the START push button!*

Definition of important units for wood chips accounting

name	unity ratio	explanation
water content	[%]	Water content is called the ratio of **water** to the **total wood mass** as a percentage *[kg/kg] x100*. This unit is used in the **Biomass- Norm** for **wood chips**: $w = \frac{m_{water}}{m_{total}} * 100 = \frac{m_{water}}{m_{dry\ mass}+m_{water}} * 100$ 1000 kg wood chips with 40 % WC => 400 kg water & 600 kg wood chips
wood moisture	[%]	Wood moisture is called the ratio of **water** to the **dry wood mass** as a percentage *[kg/kg] x100*. This unit is used in the **General Wood Norm** for **split logs**: $u = \frac{m_{water}}{m_{dry\ mass}} * 100$ but $m_{water} = m_{total} - m_{kiln-dry\ weight}$ 1000 kg split logs with 40 % WC => 400 kg water & 600 kg split logs 400 kg water & 600 kg split logs => 66,7 % wood moisture

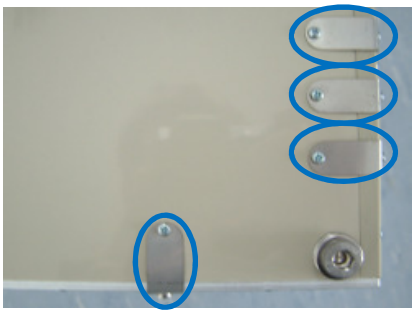
name	unity on weight basis	explanation
dry weight (atro weight)	[kg]	Dry weight (atro weight) is called the **weight of wood chips** without the included water. It is also called **atro tons**: $dry\ (atro) = m_{total} * (100 - WC)$ 1000 kg wood chips with 40 % WC => 600 kg wood chips **dry (*atro*)**

name	unity on volume basis	explanation
bulk density	$\left[\frac{kg}{m^3}\right]$	**Weight of wood chips per cubic metre** (inclusive the water in the wood chips) $bulk\ density = \frac{m_{total}}{V_{total}}$ 1000 kg wood chips have a volume of 3,33 m³ => 300 $\frac{kg}{m^3}$
$\frac{dry\ weight}{m^3}$ $\frac{atro\ weight}{m^3}$	$\left[\frac{kg}{m^3}\right]$	Weight of the wood chips **without any water per cubic metre** $\frac{dry\ weight}{m^3} = \frac{bulk\ density * (100 - WC)}{100}$ 300 $\frac{kg}{m^3}$ bulk density with 40 % WC => 180 $\frac{kg}{m^3}$ $\left[\frac{dry\ weight}{cubic\ metre}\right]$

Self-calibration - fault correction

If the values of the self-calibration exceed a certain limit, the procedure is stopped for reasons of safety.

For this fault, a pollution of the contacts at the bottom of the measuring chamber may be responsible. In this case slightly sand the stainless steel contacts (marked in blue on the picture) using 400 grade abrasive paper. Afterwards the contacts have to be cleaned with alcohol.



If after that procedure the self-calibration is still not successful, please contact Schaller GmbH. **Note**: *For the self-calibration the measuring chamber has to be empty and cleaned!*

Pictures of wood chips types

Woodchips

Coarse ch.

Industr. WC

Notes for bulk density and bone dry weight (atro) / m³

For determining the bulk density according to the norm EN14961 a round bucket is used. As the humimeter BMA uses a rectangular measuring box, we have entered a compensation factor in the device. This compensation factor has been optimised for wood chips and therefore can differ when measuring other material types. The bulk density of biomass material during transport can change considerably (compacting), when measuring the volume a material cone has to be considered.
An eventual discrepancy of the bulk density directly influences the displayed dry weight /m³.

Notes for comparison measurement with drying oven

The humimeter BMA uses a much higher sample quantity than the drying oven (12-fold to 20-fold quantity of kiln-drying method). Furthermore, to determine a more accurate average moisture value in case of inhomogeneous material, the humimeter BMA enables a large number of measurements within a short time. Considering a sampling error due to the considerably smaller sample quantity as well as the content of volatile matters, resin etc. (that are not water), the kiln-drying method will practically reach an accuracy of approx. +/- 3%. Therefore, if the measuring values of these two very different methods of determining the water content are compared, differences of +/- 3% can be considered to be normal.

Notes for shavings and wood chips made of fast growing wood

- ⇨ Weight of shavings must be more than 380g. If you go below that weight you have to compress the shavings in measuring chamber up to 380g.
- ⇨ Wood chips of fast growing wood chips which are produced with a field chopper have to be measured with calibration curve “Woodchips”.

Exemption from liability

For miss-readings and wrong measurements and of this resulting damage we refuse any liability. This is a device for quick determination of moisture. The moisture depends on multiple conditions and multiple materials. Therefore we recommend a plausibility check of the measuring results. Each device includes a serial number and the guarantee stamp. If those are broken, no claims for guarantee can be made.

Technical data

Resolution	0.1% water content
Measuring range	5 to 70% water content (dependent on the material)
Operation temperature	0 °C to +50 °C
Storage temperature	-20 °C to +60 °C
Temperature sensor	Infrared (non-contact)
Temperature compensation	automatic
Power supply	100-240 VAC, 1 A, 50-60 Hz
Plug	Schuko plug as per CEE 7/7
Display	128x64 matrix display lighted
Dimensions (BxTxH)	432 x 282 x 862 mm
Weight	approx. 26 kg (with measuring box)
Degree of protection	IP 40

Scope of delivery	**humimeter BMA**
	BMA measuring box (12 litre)
	power supply unit 12 VDC, 4 A
	2 pieces bucket, 13 litre

Options	determination of bulk density and bone dry weight (atro)
	USB data interface module
	integrated printer for BMA
	Rechargeable batteries

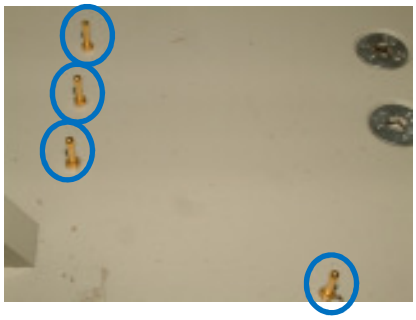
!IMPORTANT! Please read

Most common reasons for incorrect measurements

- ***Product temperature out of application range***
  Material **below 0°C** resp. **above +50°C** may cause faulty measurements.
- ***Measuring material is frozen or mixed with snow***
  In these cases the accuracy is decreasing heavily.
- ***Wrong calibration curve***
  Before starting a measurement please double-check if you have chosen the right calibration curve (material).
- ***Wet or mouldy material***
  In this case the accuracy may decrease.
- ***Moisture measurement of barks***
  In case of uneven shape of barks in comparison of wood chips, the accuracy may decrease.
- ***Wrong filling quantity***
  Ensure that the measuring box is filled with material completely; there must not be less neither more material in it.
- ***Wrong filling procedure***
  Place the measuring box on the floor and pour the material into it. Use delivered bucket for that action at every time.

Device maintenance instructions

To provide a long life of your device please do not expose it to strong mechanical loads, extreme heat, rain and heavy dust.
The weighing plate (grey plastic plate at the bottom of the BMA) has to be free from wood chips and dirt. In case of pollution please vacuum-clean the weighing plate.



Mind the golden contacts, they must not be touched!

At the bottom of BMA housing is a cover plate for cleaning screwed. You can remove that and vacuum-clean inside.Clean the measuring box using a **dry cloth or a soft brush**. Any kind of wet cleaning and any use of cleaning powder may damage the device. The **device and the measuring box are not rainproof**, keep them in dry areas!